

Concept Review

Section: Where Did the Elements Come From?

Complete each statement below by writing the correct terms or terms.

- Most of the atoms in living things are of just six elements,
_____, _____,
_____, _____,
_____, and _____.
- Immediately after the big bang, temperatures were extremely high and only _____ could exist.
- As the universe began to cool, energy was converted to _____, in the form of _____,
_____, and _____.
- As the universe continued to cool, these particles joined and formed the first two elements, _____ and _____.
- The temperatures in stars get high enough to fuse _____ nuclei with one another, forming elements of still higher atomic numbers.
- Massive atoms such as iron and nickel form by repeated _____.
- When a massive star has converted almost all its core hydrogen and helium into heavier elements, it collapses and blows apart in an explosion called a _____ forming elements heavier than iron.
- The nuclear reaction that changes one nucleus into another by radioactive disintegration or by bombardment with other particles is called _____.

Concept Review *continued*

9. Elements that chemists have created are called _____ elements.

10. The special equipment that scientists use to create elements are called _____.

Answer the following questions in the space provided.

11. There are 93 naturally occurring elements, yet the periodic table contains 113 elements. Briefly explain the difference in the two numbers.

12. Why are there limits to the synthetic elements that a cyclotron can produce?

13. How does a synchrotron accelerate particles to create synthetic elements?

14. What is the difficulty in identifying superheavy elements?

Concept Review: Trends in the Periodic Table

1. ionization energy
2. bond radius
3. electron affinity
4. electronegativity
5. increases, decreasing
6. d
7. a
8. c
9. The electron cloud model is based on the probability of finding an electron at a specific location. As you move farther out from the nucleus, the probability of finding electrons becomes less and less. With this model there is not a well-defined boundary of the individual atom.
10. Na; because it has one more energy level than Li.
11. Electron shielding is the reduction of the attractive force between a positively charged nucleus and its outermost electrons due to the cancellation of some of the positive charge by the negative charge of the other electrons.
12. As the outermost electrons are pulled closer to the nucleus, they also get closer to one another and repulsion gets stronger. At Group 13, the electrons will not come closer to the nucleus because the electrons repel each other.
13. Each element has one more occupied energy levels than the one above it. Therefore, the outermost electrons are farther from the nucleus as you move down a group. Also, each successive element contains more electrons between the nucleus and the outermost electrons. These innermost electrons shield the outermost electrons from the full attractive force of the nucleus, thereby making it easier to remove valence electrons.

14. As you move across a period, each atom has one more proton and one more electron in the same principal energy level as the one before it. Therefore, because electron shielding does not change, the nuclear charge increases across a period, attracting the electrons more strongly.

15.

	General Trend	
	Across a Period	Down a Group
Ionization Energy	increases	decreases
Atomic Radius	decreases	increases
Electronegativity	increases	decreases
Ionic Size	decreases	increases
Electron affinity	increases	decreases

Concept Review: Where Did the Elements Come From?

1. carbon, hydrogen, oxygen, nitrogen, phosphorous, and sulfur
2. energy
3. matter, electrons, protons, and neutrons
4. hydrogen, helium
5. helium
6. fusion reactions
7. supernova
8. transmutation
9. synthetic
10. particle accelerators
11. The 93 naturally occurring elements are found on Earth or on stars. The remaining 20 elements are synthetic.
12. Cyclotrons cannot accelerate particles fast enough because as the particles accelerate, they become more massive, making it increasingly difficult to achieve further acceleration.
13. A synchrotron times its energy pulses to match the acceleration of the particle, thereby accelerating particles to enormous speeds.
14. Only a few atoms are created and they last for tiny fractions of a second.